DAVID EVANS
AND ASSOCIATES INC.

Technical Memorandum

DATE: May 23, 2011

TO: David Mach, P.E.
Project Manager
City of Lynnwood
19100 44th Avenue W
Lynnwood, WA 98036

FROM: Victor Salemann, PE
Senior Associate

SUBJECT: 196th Street SW/Promenade Intersection Alternative Evaluation

PROJECT: 196th Street SW (SR 524) Improvement Project Supplement 5

PROJECT NO.: LYNN0000-0014

COPIES: File

The City of Lynnwood contracted David Evans and Associates, Inc. to evaluate the feasibility of five intersection scenarios and supporting land use combinations at the intersection of 196th Street (St) SW and the future Promenade (herein identified as 38th Avenue (Ave) W) as described in the Lynnwood City Center Parks Master Plan and City Center Sub-Area Plan. This Technical Memorandum reports the results of the evaluation, including levels of service (LOS) and queue lengths at the intersections on 196th St SW between 40th Ave W and 37th Ave W.

ASSUMPTIONS AND METHODOLOGY

The assumptions and methodology used for this analysis are described as follows:

1. A shared commercial type approach (38th Ave W) was assumed, serving the Convention Center and the adjacent site to the west (north of 196th St SW), and the parcels west of 36th Ave W south of 196th St SW.
2. Minimum signal warrant volumes were determined by using the Lynnwood calibrated 2005 model to forecast the trips entering and exiting the south leg of 38th Ave W, assuming commercial land use of retail and office at a 50-50 split.
3. The City's 2025 model was used to obtain the 2025 volumes.
4. Standard A in MUTCD 2009 (Signal Warrant 3: Peak Hour) was used to determine the minimum signal warrant volumes. The criteria in Standard A is as follows:
    - Stop delay = 4 vehicle-hours for one-lane approach
    - Minor street approach volumes ≥ 100 vehicle/hour for one moving lane
    - Total entering volumes > 800 vehicles/hour for four-approach intersection
5. A forecast was created for the intersection of 196th St SW & 38th Ave W, and the SYNCHRO Program was used to optimize the signal timing at the three intersections on 196th St SW at 40th Ave W, 38th Ave W, and 36th Ave W. These three intersections are actuated-coordinated.

6. Intersection LOS and queues were evaluated using the SYNCHRO program, and queuing was verified using SIMTRAFFIC.

SCENARIOS TESTED

- **Scenario 1:** 2005 volumes for other intersections + 2005 existing 5-lane roadway on 196th St SW + *signal control at 38th Ave W: 2005 SB approach volumes and 2005 minimum signal warrant volumes on NB approach (signal warrants governed by the NB approach volumes).*

- **Scenario 2:** 2005 volumes for other intersections + 2005 existing 5-lane roadway on 196th St SW + *signal control at 38th Ave W: 2025 planned volumes on the SB and NB approaches.*

- **Scenario 3:** 2025 volumes for other intersections + 2025 7-lane roadway on 196th St SW + *signal control at 38th Ave W: 2025 SB approach volumes and 2005 minimum signal warrant volumes on NB approach (signal warrants governed by the NB approach volumes).*

- **Scenario 4:** 2025 volumes for other intersections + 2025 7-lane roadway on 196th St SW + *signal control at 38th Ave W: 2025 planned volumes on the SB and NB approaches.*

- **Scenario 5:** 2025 volumes for other intersections + 2025 7-lane roadway on 196th St SW + *right-in/right-out control at 38th Ave W: 2025 planned volumes on the SB and NB approaches.*

CONCLUSIONS

A new intersection combined with the Promenade at the approximate location of 38th Ave W could have positive or negative effects on the 196th St SW corridor. This particular section of 196th St will continue to experience high levels of traffic and congestion even after future improvements are in place. A signal at this location could improve conditions by providing more direct access to the Convention Center and City Center; however it appears likely that it could degrade conditions by creating a situation where the queues from adjacent intersections exceed available storage pocket lengths resulting in a complete breakdown of the corridor.

The assumptions used for this study were hypothetical and do not reflect an actual development proposal. Specific land uses will create very different impacts or opportunities at this location. Some may result in acceptable operations (low peak hour generators) while others (high peak hour generators) may create significant congestion problems.

In general, the smaller the development (and the lower the peak hour trip generation), the higher likelihood a traffic signal at 38th Ave W could be supported.

Challenges to an intersection at this location include approval by WSDOT and the ability to manage the amount of traffic using the intersection over time.

RECOMMENDATIONS

More information related to the specific development accessing the potential intersection is necessary before a recommendation can be made. A detailed operational simulation analysis should be conducted to determine the effects of left-turn queues spilling back onto mainline through lanes. This memo can serve as a basis for future analysis when a specific development proposal is received.

FINDINGS

Intersection LOS and approach LOS and delay is shown in **Table 1** for Scenarios 1-5. The intersection-wide LOS at the study intersections is acceptable for Scenarios 1 and 2, but intersection LOS deficiencies occur at the intersections of 40th Ave W & 196th St SW and 36th Ave W & 196th St SW for Scenarios 3-5. Without the proposed signalized intersection at 38th Ave W, delay at the intersections of 40th Ave W & 196th St SW and 36th Ave W & 196th St SW goes up due to higher left turn volumes resulting from the right-in/right-out control at 38th Ave W.

Table 1. Intersection LOS (Delay)

Intersections on 196th St SW	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
	2005 with min. signal warrant volumes and signal at 38th Ave W	2005 with planned volumes and signal at 38th Ave W	2025 with min. signal warrant volumes and signal at 38th Ave W	2025 with planned volumes and signal at 38th Ave W	2025 with planned volumes and RIRO at 38th Ave W
At 40th Ave W					
Intersection-wide	D (48.6)	D (48.4)	F (80.7)	F (81.5)	F (127.1)
EB	E (56.6)	E (56.6)	F (82.2)	F (80.5)	F (136.7)
WB	C (31.1)	C (30.6)	D (54.8)	E (58.7)	F (115.2)
NB	E (76.2)	E (76.2)	F (160.4)	F (157.8)	F (150.0)
SB	E (63.1)	E (63.1)	F (103.3)	F (106.4)	F (114.3)
At 38th Ave W					
Intersection-wide	B (18.5)	C (29.0)	D (47.0)	C (22.0)	B (12.6)
EB	B (12.3)	C (21.9)	D (47.8)	A (9.5)	-
WB	B (15.6)	B (10.8)	C (34.4)	C (25.9)	-
NB	D (52.9)	D (44.1)	E (58.5)	D (45.0)	B (11.9)
SB	E (57.9)	F (193.4)	F (157.2)	F (101.4)	B (12.6)
At 36th Ave W					
Intersection-wide	C (34.1)	C (34.3)	F (98.5)	F (90.3)	F (111.7)
EB	C (32.7)	C (33.3)	E (56.6)	E (59.1)	F (81.5)
WB	C (30.7)	C (30.7)	F (152.5)	F (130.6)	F (156.7)
NB	-	-	-	-	-
SB	D (48.5)	D (48.5)	E (60.8)	E (61.4)	E (59.2)

The 95th percentile queue lengths (feet) are shown in **Table 2**. Substantially longer queues (exceeding pocketing lengths) are found at the EB left-turn pocket at the intersection of 196th St SW & 36th Ave W in 2025 conditions with or without the introduction of the proposed intersection at 38th Ave W.

The SB and WB left-turn queues at the intersection of 196th St SW & 40th Ave W are longer than the pocket lengths.

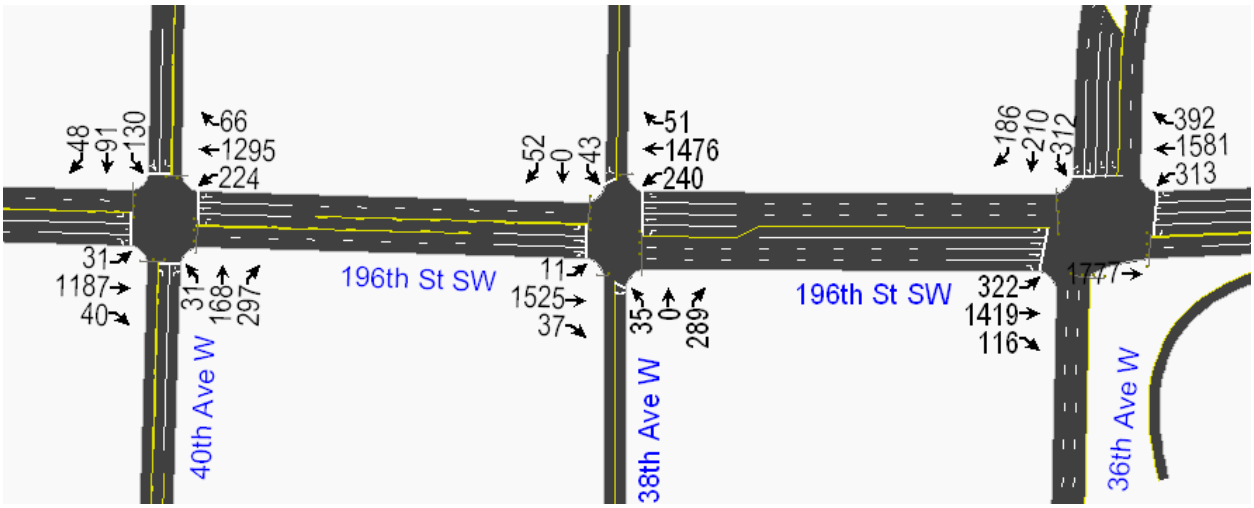
The introduction of the proposed intersection at 38th Ave W could reduce the storage of the adjacent intersections and result in minimum turn pocket lengths for the intersection at 38th Ave W.

Table 2. 95th Percentile Queue (Feet)

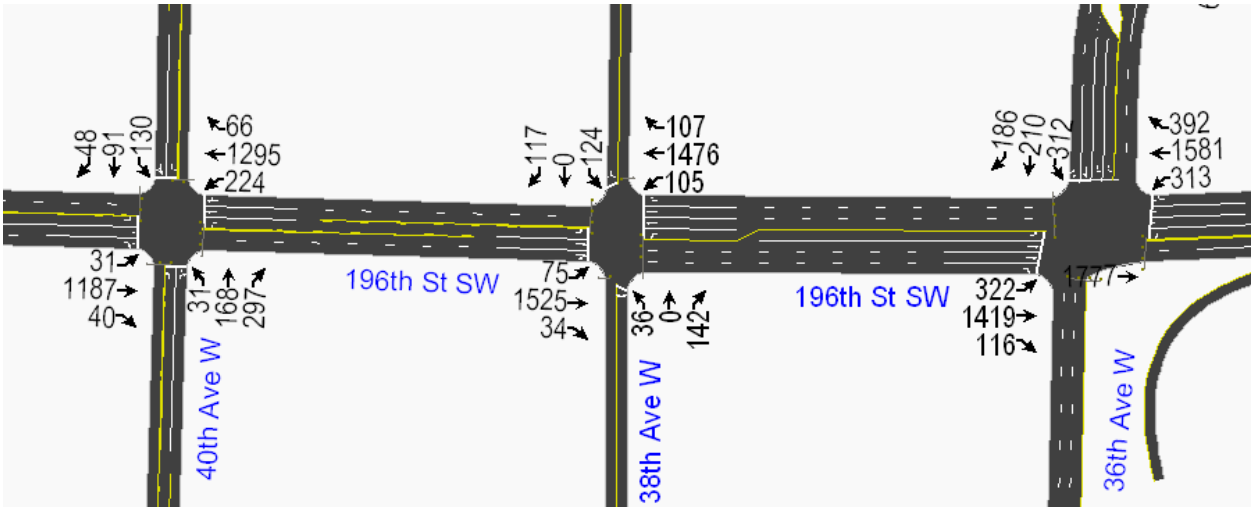
Intersections on 196th St SW	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Pocket Length (Feet)	
	2005 with min. signal warrant volumes and signal at 38th Ave W	2005 with planned volumes and signal at 38th Ave W	2025 with min. signal warrant volumes and signal at 38th Ave W	2025 with planned volumes and signal at 38th Ave W	2025 with planned volumes and RIRO at 38th Ave W	2025 with 38th Ave W	Existing without 38th Ave W
At 40th Ave W							
EBLT	39	39	183	215	187	250	250
WBLT	354	333	381	382	315	225	>225 if TWLT used
NBLT	61	61	137	131	134	100	100
SBLT	239	239	426	452	505	125	125
At 38th Ave W							
EBLT	9	89	79	74	-	100	-
WBLT	286	116	207	107	-	100	-
At 36th Ave W							
EBLT	311	336	891	1020	804	300	>350 if TWLT used
WBLT	404	404	158	156	158	250	250
SBLT	174	174	21	29	62	Double left 150-300	Double left 150-300

Attachment: Intersection Volumes for all Scenarios

Intersection Volumes – Scenario 1



Intersection Volumes – Scenario 2



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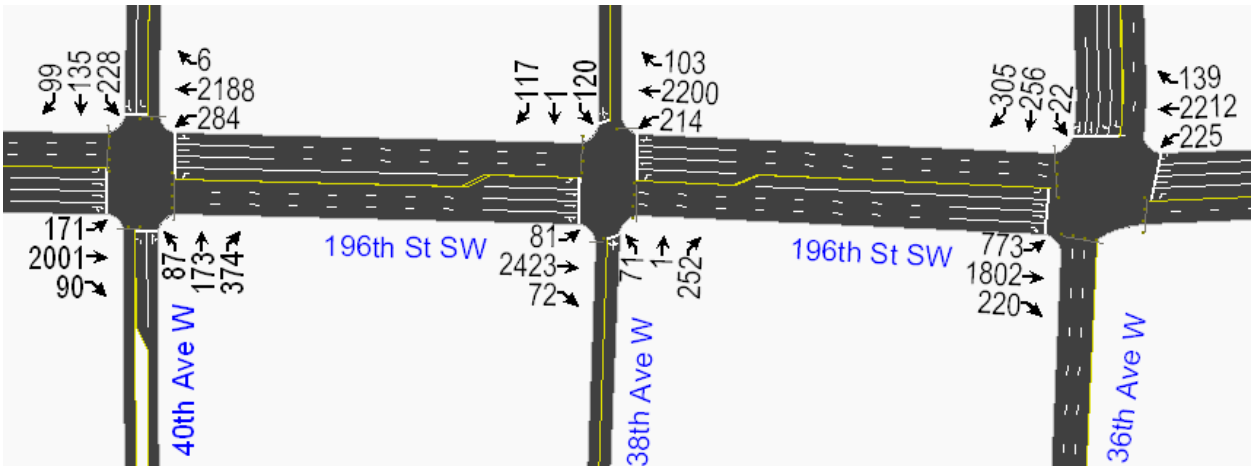
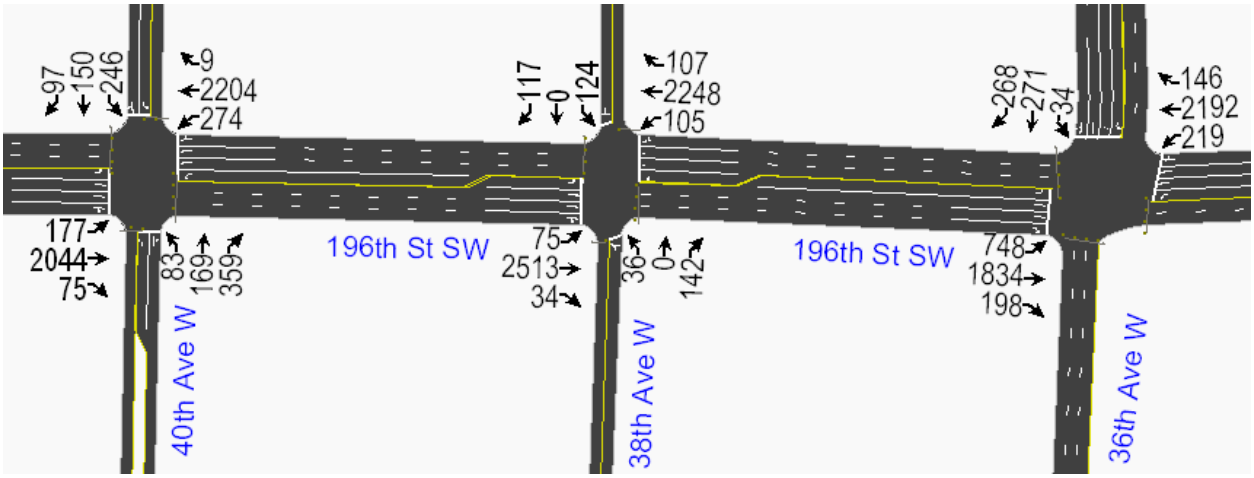
Intersection Volumes – Scenario 3



Intersection Volumes – Scenario 4



Intersection Volumes – Scenario 5